

INTERPERSONAL RELATIONS: COOPERATION AND COMPETITION

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Social relations between two persons require that consequences each receives depend at least in part on the responses of the other. Historically, research in several areas has focused on two contingencies, cooperation and competition, in which reinforcement is determined by the responses of both participants. A major research question in social psychology and applied behavior analysis has been: Which contingency is more effective with regard to the quantity or quality of some response? Although this question has not been addressed in the experimental analysis of behavior, this area provides a perspective and method to more fully investigate the relevant controlling variables. Among these are the frequency of opportunities to audit the performances of others, information (or lack of it) provided by social or nonsocial stimuli with regard to reinforcement and performance, degree of face-to-face interaction, types of reinforcement contingencies, and number of participants. A neglected dependent variable is cost effectiveness—amount of behavior maintained by a given reinforcer amount. The larger agenda for the experimental analysis of interpersonal relations includes a variety of forms of reinforcement interdependence that raise issues of basic and applied interest.

Key words: interpersonal relations, social behavior, cooperation, competition, social stimuli, social audits, reinforcement contingencies

The variety of interpersonal relations encountered every day belies the simplicity of their most general behavioral features. Social relations between two persons require that the consequences received by each depend at least in part on the responses of the other. How great a part these reciprocal effects play has been a key issue in attempts to distinguish different types of dependence. For example, Hake and Olvera (1978) and Hake and Vukelich (1972) distinguish between contingencies in which each person's reinforcers are determined solely by the other's responding (termed dependent), and those in which those reinforcers are determined jointly by the responses of both (termed interdependent). Similar distinctions are made by Kelley and Thibaut (1978) between fate control and behavior control in

their social-psychological analysis of interpersonal relations, and by Emerson (1981) between exchange and productive exchange in his analysis of social power. The importance of this distinction stems from the very different problems the two types of contingencies present in the development and maintenance of social relations (e.g., Molm, 1981b; Molm & Wiggins, 1979).

Historically, research has focused on interdependent contingencies in which reinforcement is determined jointly. Two variations in particular, cooperation and competition, have been studied in one of the longest-standing experimental traditions in the social sciences. Reflecting reward arrangements ubiquitous throughout society, it is currently active in several research traditions including social psychology, applied behavior analysis, and basic research in the experimental analysis of behavior. As it is usually defined, the key element in a cooperative contingency is mutual reinforcement. All participants receive a reinforcer if their responses meet a specified criterion. In a competitive contingency, reinforcers are

This paper is dedicated to Don Hake, an exemplar. An earlier version of this paper was presented at a session honoring him at the 1983 meeting of the Association for Behavior Analysis, Milwaukee, Wisconsin. Reprints may be obtained from David R. Schmitt, Department of Sociology (DK-40), University of Washington, Seattle, Washington 98195.

received by only some of the participants. Reinforcement depends on how highly a response is ranked on a specified criterion.

Although the definition offered above for cooperation is the most common (Marwell & Schmitt, 1975), it was not used by Hake and his associates (e.g., Hake & Olvera, 1978) in their extensive research program. Their definition is less restrictive and includes occasions during which each person's reinforcers are determined by the other person (a dependent contingency), provided the result over time approaches reward equity. The behavior in this circumstance is usually termed exchange, and has become a major interdisciplinary research topic (e.g., Blau, 1964; Emerson, 1981). Because the inclusion of this condition introduces other variables, I prefer to continue the practice of distinguishing between cooperation and exchange.

In differing research traditions, research investigating cooperation and competition has focused on different aspects of these contingencies. For example, the work in social psychology has had applied as well as experimental focus. People in educational and work settings often have imposed contingencies on groups of subordinates, and have asked which contingency is more productive—most often in terms of the quantity or quality of some specified response (ranging from adding numbers and picking up objects to discussion contributions and solving complex problems). For several decades these contingencies were compared using a variety of tasks and in a number of different settings, but with inconsistent results. In more recent years it has become clear that task and setting characteristics play a decisive role (Miller & Hamblin, 1963; Rosenbaum, 1979; Schmitt, 1981). Cooperation typically leads to superior performance when task performance is facilitated by coordination, division of labor, or assistance, because these activities are reinforced only under cooperative contingencies. Under competitive contingencies they typically are not reinforced (Deutsch, 1973). These findings have led some (e.g., Johnson, Maruyama, Johnson, Nelson, & Skon, 1981) to advocate the

wider implementation of cooperative contingencies in education.

In the past decade and a half, contingencies similar to those of cooperation in social psychology have been investigated in applied behavior analysis under the title of group contingencies. These studies have shared with social psychology a focus on the quantity or quality of some specified response, for example, academic tasks and disruptive behavior. The settings frequently have allowed subjects to interact, thus permitting them to sanction or assist one another. Various types of group contingencies have been compared, but the reference has been individual contingencies or the absence of reinforcement rather than competition. Different types of group contingencies have been distinguished with regard to the performance criteria upon which reinforcement is based. Typical bases include the average performances of all group members or the performances of selected members (e.g., the highest, the lowest, or a randomly selected performance). When the basis is the highest or lowest performance, the person typically is identified in advance. In the case where the lowest performance is the basis for reinforcement, this often results in assistance being provided by the better performers. Group contingencies, regardless of type, are typically equal or superior to individual contingencies and both are superior to the absence of contingencies (Hayes, 1976; Litow & Pumroy, 1975). The added benefits of assistance in the lowest-performer variation have led to recommendations that it be more widely adopted (e.g., Hamblin, Hathaway, & Wodarski, 1971; Speltz, Shimamura, & McReynolds, 1982).

In the experimental analysis of cooperation and competition, the focus has been on a range of controlling stimuli in addition to reinforcement contingencies. Examples include response costs, reinforcer inequities, nonsocial alternative responses, and the physical presence of the participants (e.g., Hake & Olvera, 1978; Lindsley, 1966; Marwell & Schmitt, 1975; Molm & Wiggins, 1979). Heretofore, most experimental

analyses of cooperation or competition have investigated different combinations of reinforcement contingencies and other controlling stimuli, and have served to show the response patterns that develop when contingencies change or features of the setting are added or withdrawn.

But experimental analyses have not addressed the applied problem of principle concern elsewhere—namely, the relative advantage of cooperation or competition under various conditions. Nor have they very fully explored several other prominent variables that frequently characterize these situations. Here experimental analyses could provide important qualifications to the recommendations noted earlier.

STIMULUS PROPERTIES OF OTHERS

The stimulus properties of others may affect one's behavior in several ways, one of which has received particular attention in social psychology. A lengthy research tradition has focused on how the mere presence of others affects one's task performance. Performance on simple tasks tends to be facilitated by others' presence, whereas performance on complex tasks tends to be hindered, although the effects are typically very small (Bond & Titus, 1983). Other possible stimulus effects have received little attention. Hake and his associates have investigated the effects of others' behavior on one's propensity to "audit"—to make a response that allows access to a score indicating how much other people have earned or how many responses they have made. Audits were compared in social and nonsocial situations (Hake, Vukelich, & Kaplan, 1973) and in situations in which a given subject's score was consistently ahead, behind, or even with that of the partner (Vukelich & Hake, 1974). Auditing was most frequent in social contexts in which scores were relatively equal. Although these results clearly show that the propensity to audit is affected by another's performance, they do not show how the stimuli provided by that response affect performance on one's own task. Nor have the

effects of variations in audit opportunities been investigated. For example, opportunities could be intermittent instead of continuous, and they could be made to change in frequency over time. The study of such audit schedules may prove of particular importance for competition. Very often competitively based reinforcers depend upon a number of responses undertaken over a specified period. Here evidence concerning the other's performance has a direct bearing on the likelihood of one's own responses being reinforced, and thus may lead to changes in effort. How do different audit schedules (e.g., information early or late in a response sequence) interact with relative performance (e.g., superior, equal, or inferior) to affect the responses of those working under competitive contingencies? The question seems to have obvious relevance in applied settings in education and industry where contests are frequently used to enhance effort. The effects of such schedules are among the most promising of the unexplored problems in the area.

Recently Hake and his associates (Hake, Donaldson, & Hyten, 1983) raised the provocative issue of the comparability of social and nonsocial stimuli. They argued that social stimuli, because of their variability and complexity, cannot be assumed to function in a manner identical to that of simple, nonsocial stimuli. Heretofore, experimenters concerned with stimuli pertaining to others' reinforcers and behavior have presented these stimuli nonsocially. For example, consider the well known social-psychological research on the effects of reward inequity on behavior (e.g., Berkowitz, 1976). Inequity among persons (as defined by the ratio between number of responses and amount of reward) has been shown to affect responses, but typically in contexts in which that information is presented unambiguously by the experimenter. Thus, Schmitt and Marwell (1972) found that when two subjects in a laboratory setting received unequal pay (as shown by points on a counter) for identical cooperative work, the lower paid subject occasionally switched to an alternative task

that gave lower but equal pay to both subjects. In natural groups, by contrast, the stimuli indicating amount of work and reinforcement are often present only briefly, and are likely to be much more ambiguous and complex. Such stimuli may have quite different effects.

With face-to-face interaction, opportunities are provided for other types of social behavior to emerge. To date the emphasis in research on these situations has been on collateral behavior. In both social-psychological (e.g., Rosenbaum, Moore, Cotton, Cook, Heiser, Shovar, & Gray, 1980) and applied behavioral research (e.g., Hayes, 1976), cooperative contingencies have been shown to enhance helping and assisting among group members. By contrast, competitive contingencies often produce obstructive behavior (e.g., Miller & Hamblin, 1963; Rosenbaum et al., 1980). Face-to-face interaction also allows members to introduce their own contingencies, termed dependent contingencies (unrelated to the definition used by Hake and his associates) by Weingarten and Mechner (1966). These consequences could play a significant role in at least two types of circumstances. First, many cooperative contingencies (as with several of the types of group contingencies) do not require that everyone make some response. Although some within the group may initially make the contributions necessary for reinforcement, over time these persons may impose their own contingencies on nonresponders in attempts to induce more equal contributions (one solution to the "free-rider" problem). Second, consequences provided by group members (e.g., praise or blame) may supplement those produced by task performance. Such consequences might be important in sustaining behavior during periods in which no task-based reinforcement is received. Slavin (1977) has suggested that such consequences of face-to-face contact explain the superiority of cooperation over competition.

REINFORCEMENT CONTINGENCIES

The mix of social and nonsocial conse-

quences may create complex reinforcement contingencies for performance. But despite their dominant role in the investigation of individual behavior, such contingencies have been given scant attention in social situations. Most studies, including those in applied behavior analysis, have investigated social behavior over periods in which too few responses are emitted for many of their effects to develop. For example, consider cooperation. By definition cooperative contingencies cannot ensure a perfect correlation between changes in an individual's behavior and reinforcement. The correlation for that individual can be higher or lower, however, depending on the size of the group, the number of persons who must respond, and the consistency of other peoples' performances. In cases in which not all persons need respond, as in some group contingencies, there is the possibility that the contingency may reinforce substandard task performance or behavior that is unrelated to the task. A provocative but infrequently cited study by Egerman (1966) in which only one of two team members needed to make a particular response for both to be rewarded found reduced response accuracy only after some 1300 responses made over approximately 10 hours of work. A cautionary note thus should be added to the conclusion drawn from comparisons of various group contingencies in applied behavior analysis. Studies showing consequences based on the performances of a few members to be similar to those based on the group average have been conducted over periods during which no more than a couple of dozen reinforcers have been delivered—few opportunities for the reinforcement of inaccurate responses, nonresponding, or task-irrelevant responses emitted by persons whose behavior is not part of the contingency.

For competition, the contingencies that result are strongly affected by the initial performances of the competitors. If performance differences are small and there is at least some variability over time, each competitor's behavior is likely to be reinforced at least occasionally. Increases or decreases in

responding are likely to produce corresponding changes in frequency of reinforcement. Thus, among equal competitors, group productivity is unlikely to decline and may increase over time—assuming that the competitors do not collude. If performance differences are large and variability over time is not great, only performances of the superior competitor will be reinforced. Neither increases nor decreases in performance will produce changes in reinforcement. Inferior competitors should eventually cease responding, and may withdraw from the situation. The performance of superior competitors should also decline because poorer, less effortful performances will continue to be reinforced.

A pervasive problem in studies of cooperation and competition has been the failure to distinguish transitional from steady-state contingency effects (Sidman, 1960). Studies of group contingencies, in particular, have failed to examine samples of behavior in which such effects are likely to emerge. Although an analysis of contingencies can become highly complex in interpersonal relations, the effort appears worthwhile if our concern is with long-term performance, and if we take our cues from the powerful schedule effects found with infrahumans.

GROUP SIZE

Another variable that affects conditions of reinforcement is group size. For competition, increasing the number of competitors has at least two effects. First, it increases the attractiveness of a successful competitive response, if it is assumed that the performance of only one of the competitors is reinforced in each contest, and that the *average* reinforcer amounts for each person remain constant. For example, assume an average per person of \$3 for each contest. For two persons each competitive reinforcer would be worth \$6, whereas for three persons each would be worth \$9. A study by Schmitt (1976) indicated that reinforcer size affected the attractiveness of competition vis-à-vis cooperation when two- and three-person

groups were compared. Three-person groups tended to respond more competitively than pairs even though competing produced the same average amounts per person in the two situations. A second effect of increasing the number of competitors is a likely increase in the salience of reward inequity. The larger the group, the more persons may find it aversive to receive the lowest earnings. This may be true even when average earnings are otherwise satisfactory. If so, the poorest performers may withdraw from competition. Thus, an increase in the number of competitors may have two opposing effects. On the one hand, the increased magnitude of reinforcement may increase some individuals' performances. On the other hand, the poorest performers may be more likely to withdraw from competition. The first of these seems likely to occur immediately; the second, over time.

For cooperation, increasing the number of participants may make the now widely discussed problem of "free-riding" more likely (Messick & Brewer, 1983) on tasks for which the criterion for reinforcement is a specified amount of work or group average (the case for various group contingencies). One person's reduced responding may still be reinforced so long as the efforts of others suffice. The larger the number of performers, the greater the likelihood of continued reinforcement, provided everyone else does not act similarly.

COST EFFECTIVENESS

Heretofore, the focus of most research has been on the average or total number of responses made by all persons subject to a particular contingency, and occasionally on collateral behavior such as helping or hindering. But, surprisingly, no attention has been paid to the reinforcer amounts used to produce that behavior. In many everyday situations, reinforcers—particularly material ones—are not so plentiful that amount can be ignored. Thus it is important to ask which type of contingency maintains the greater amount of behavior for a given amount of

reinforcer. The issue is difficult to address across contingencies. For some types of competition, as in a contest or series of contests, the total amount competitors will receive is fixed in advance, and only the distribution across competitors is in question. By contrast, the amount persons will receive under cooperative (or individual) contingencies is typically not specified in advance. Reinforcement depends on whether or not a performance standard is met; it is thus either present or absent in a given episode, and may vary in amount over a series of episodes. Because of the manner in which most experiments have been conducted, it is possible that a contingency that produces superior performance does so at a higher reinforcer cost per response. Has this been true when cooperation has been superior to competition (or vice versa)? Past research fails to provide the answer.

CONCLUSION

Although the experimental analysis of interpersonal relations is rooted in the principles and methods developed in the larger field of behavior analysis, the subfield has distinctive features. The experimental study of behavior in groups is likely to encounter a greater range of dependent variables than are confronted in behavior of individuals—variables such as interaction patterns among group members, proportion of members who stay in the group over time, and range and variability of their performances. These, in addition to group output and cost effectiveness, are of interest in various contexts and are likely to be related to different independent variables (see Molm, 1981a).

A prominent feature of the experimental analysis of behavior in groups has been the tendency for researchers to develop different settings to investigate the effects of very similar variables. Although the replication of findings across settings is ultimately desirable, the current pattern seems not to have been directed toward this goal—nor toward any other. As a result, similar or identical relations are more difficult to

discern and dissimilar ones are more difficult to reconcile. Each program of research is less likely to systematically replicate and build on the findings of others. Historically, standardized settings and procedures have accompanied a rapid accumulation of knowledge in most experimental fields (and in the experimental analysis of behavior in particular).

Although I have focused on cooperation and competition in illustrating some of the considerations that arise in experimental analysis, similar points can be made for other forms of dependence and interdependence. One of these, reinforcer dependence, has received attention (e.g., Burgess & Nielsen 1974; Hake & Schmid, 1981; Matthews, 1977; Matthews & Shimoff, 1979). The exchange that typically occurs between subjects is often accompanied by reinforcer inequities that subjects find aversive. Research has focused on ways in which responding can be maintained—trust can be developed—despite temporary inequities.

The elementary examples of dependence or interdependence which have been addressed here represent only a small part of the picture in the micro-analysis of interpersonal relations. Kelley and Thibaut (1978) offer a most ambitious conceptual typology illustrating the scope and degree of complexity that results when these properties are considered in various combinations and degrees. The agenda is huge. In broader perspective, current theoretical and methodological insights bode well for the continued development of this subfield. With an array of dependent and independent variables at hand, the greater challenge may be methodological. No one who has conducted research in this area will gainsay the problems posed by longitudinal studies involving groups of subjects. But if the history of experimental analysis is a guide, significant gains in discovering controlling variables will require that these costs be borne.

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